We Claim:

1. A semiconductor processing method, which comprises:

providing a semiconductor product; and

coating the semiconductor product with an anti-reflective coating material formed of a matrix substance and of nanocrystalline particles of a material different from the matrix substance, the nanocrystalline particles being configured to absorb light via the quantum size effect.

2. The method according to claim 1, which comprises selecting an average size of the nanocrystalline particles less than 100 nanometers in diameter.

3. The method according to claim 2, which comprises selecting the size of the nanocrystalline particles with less than a quarter of a wavelength of 248, 193, 157 or 127 nm of UV exposure light.

4. The method according to claim 1, which comprises choosing a material of the particles to thereby create additional energy levels within band gaps of the matrix substance, the band gaps having a predefined distance to a valence band or to a conduction band corresponding to a wavelength absorbed via the quantum size effect.

5. The method according to claim 4, which comprises choosing the material of the particles to effect absorption via the quantum size effect of a wavelength in the UV range.

6. The method according to claim 1, which comprises choosing the matrix substance and a material and a concentration of the particles to thereby achieve a refractive index granting maximum light entrance into the ARC layer material.

7. The method according to claim 1, which comprises choosing a material and a concentration of the particles for tuning a degree of absorption.

8. The method according to claim 1, which comprises choosing the matrix substance and a size and a concentration of the particles to thereby tune a viscosity value.

9. The method according to claim 1, which comprises choosing the matrix substance and a material and a concentration of the particles for tuning an etch resistance of a dry etch process for etching semiconductor substrates.

10. The method according to claim 1, wherein the matrix substance is selected from the group consisting of an organic resin, a silicate, and an oxide.

11. The method according to claim 1, wherein the matrix substance is an oxide selected from the group consisting of silicon oxide and titanium oxide.

12. The method according to claim 1, wherein a material of the particles is selected from the group consisting of a metal oxide, a metal sulphide, and a perovskite material.

13. The method according to claim 1, wherein the particles contain a material selected from the group consisting of tin oxide, titanium oxide, and cadmium sulphide.

14. The method according to claims 1, wherein the ARC layer contains between 3 and 70 % per volume of nanocrystalline particles.

15. The method according to claims 1, wherein the ARC layer contains nanocrystalline particles of at least two different materials.

16. The method according to claim 1, which comprises coating a semiconductor substrate to be patterned or a layer to be patterned on a semiconductor substrate with the anti-reflective coating material to form an anti-reflective coating layer dimishing light reflection of exposure light.

17. The method according to claim 1, which comprises, prior to the coating step:

providing the matrix material and the nano-crystalline particles; and

mixing the matrix material and the nano-crystalline particles to form the anti-reflective coating material.

18. The method according to claim 17, which comprises choosing at least one of a type of the nano-crystalline particles and a concentration of the nano-crystalline particles in the matrix material to thereby forming an anti-reflective coating material having an adjusted refractive index.

19. The method according to claim 17, which comprises adjusting a refractive index $\varepsilon 1$ of the anti-reflective coating material by choosing at least one of a type and a concentration of the nano-crystalline particles in dependence on a refractive index $\varepsilon 0$ of a resist layer to be applied onto the anti-reflective coating material and/or in dependence on a refractive index $\varepsilon 2$ of a semiconductor substrate to be patterned or of a layer to be patterned on a semiconductor substrate.

20. A semiconductor product, comprising:

a substrate having a surface;

a layer of an anti-reflective coating material formed on said surface;

said anti-reflective coating material comprising a matrix substance and nanocrystalline particles of a material different from said matrix substance, and said nanocrystalline particles being configured to absorb light via the quantum size effect.

21. The semiconductor product according to claim 20, which further comprises a resist layer on top of said layer of the anti-reflective coating material.